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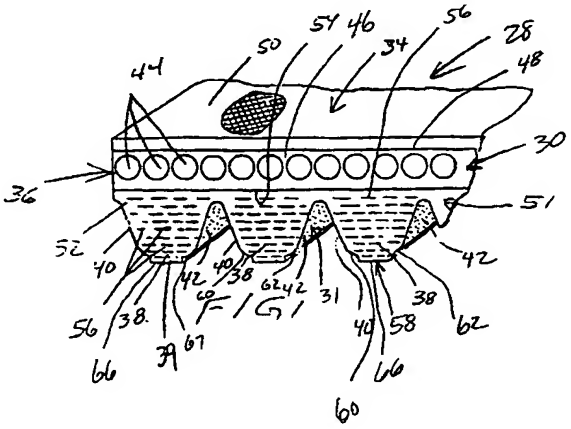
(54) **V-ribbed belt and grinding wheel for forming the belt.**

(57) A power transmission belt having an endless body with a length and defining an elongate rib (38). The body has an inside, an outside, and laterally spaced sides. The rib has an exposed surface (40,42) to engage with a cooperating pulley. At least a first portion of the exposed rib surface is formed by at least one of grinding and cutting. There is a second portion (66) of the exposed surface that is neither cut nor ground during formation of the power transmission belt.



EP 0 633 408 A2

tends continuously from one of the pulley-engaging rib surface portions to the first surface portion to define a part of the first surface portion. The exposed rib surface portion defined by the arc of a circle may terminate at the projection.

The power transmission belt may be a V-belt, a V-ribbed belt, or the like, wherein the rib(s) extends continuously along the length of the body.

The belt body has a compression section. A plurality of laterally extending fibers can be provided in the compression section, which fibers have a length of 2-10 mm.

The compression section is normally made at least partially from rubber, with the fibers embedded in the rubber in an amount from 5-30 weight parts of fiber per 100 weight parts of rubber. The fibers in the compression section may be at least one of a) a synthetic fiber yarn having mono-filaments of one of nylon, vinylon, polyester, and aramid, and b) natural fiber yarn that is at least one of cotton and pulp.

In one form, the belt body has a cushion rubber layer with there being a load-carrying member in the cushion rubber layer.

The cushion rubber layer may be at least one of chloroprene rubber (CR), hydrogenated nitrile rubber (HNBR), CSM rubber, natural rubber (NR), styrene-butadiene rubber (SBR), and butadiene rubber (BR).

The load-carrying member embedded in the cushion rubber layer may be made from at least one of polyester, nylon and aramid fiber.

In one form, the cushion rubber layer has an inside surface and an outside surface and there is at least one canvas layer on one of the inside and outside surfaces of the cushion rubber layer. The canvas layer may be impregnated with rubber and is made from warp and weft yarns woven to be extendable in a lengthwise direction, with the yarns being at least one of cotton and a blend of cotton and synthetic material.

The invention further contemplates a power transmission belt having an endless body with a length and defining an elongate rib. The body has an inside, an outside and laterally spaced sides. The rib has an exposed surface to engage with a cooperating pulley, and a free end portion having a first surface portion facing in one of an inside and outside direction. There is a discrete projection on the first surface portion, which projection has a height between the inside and outside of the belt that is not greater than 0.3 mm.

In one form, the power transmission belt is a V-ribbed belt with a plurality of ribs having the construction described above.

The discrete projection can have a flat surface facing in one of an inside and an outside direction on the belt.

The invention further contemplates a grinding wheel for producing a V-shaped rib on a power transmission belt. The grinding wheel has a cylindrical body with a central axis. A plurality of radial projections are provided with there being facing grinding surface portions on axially adjacent projections. A radially facing base surface portion is provided between axially adjacent projections. An undercut extends radially inwardly from the base surface portion and continuously through 360° around the cylindrical body.

The undercut preferably has a radial extent of at least 1.0 mm inwardly of the base surface portion.

The radially extending projections have a radial outermost edge that is convex.

The facing grinding surface portions are roughened by the deposit of a material thereon or by abrading or otherwise treating the grinding surface portions. The deposited particles may be made from diamond.

The base surface portion and facing grinding surface portions are joined by a concave surface portion. The concave surface portion may be defined by the arc of a circle.

Brief Description of the Drawings

Fig. 1 is a fragmentary, cross-sectional, perspective view of a V-ribbed belt according to the present invention;

Fig. 2 is an enlarged, fragmentary, perspective view of the free end of a rib on the belt in Fig. 1 inverted from the Fig. 1 orientation;

Fig. 3 is an enlarged, fragmentary, cross-sectional view of a rib on the inventive belt in relationship to a cooperating pulley;

Fig. 4 is a fragmentary, cross-sectional view of a grinding wheel used to form the belt in Figs. 1-3;

Fig. 5 is a fragmentary, cross-sectional, perspective view of a prior art, V-ribbed belt;

Fig. 6 is a schematic, side elevation view of a drive system for a pulley on a conventional washing or drying machine with a V-ribbed belt thereon; and

Fig. 7 is a side elevation view of the system of Fig. 6.

Detailed Description of the Drawings

In Figs. 1-3, a power transmission belt, according to the present invention, is shown at 28. The belt 28 illustrated is a V-ribbed belt. It should be understood that the inventive concept can be practiced with various other types of belts, i.e., a V-belt.

The belt 28 has a body 30 with an inside face 31 to engage a cooperating pulley 32, an outside face 34, and laterally spaced sides 36 (one shown). The belt 28 has laterally spaced, longitudinally extending, V-shaped ribs 38, each having an exposed pulley-engaging surface 39, including oppositely facing, pulley-

projection 64 on the completed belt 28. A shallower depth than 1.0 mm may cause grinding of the flat surface portion 66 on the projection 64, which has the disadvantages stated above.

In operation, the grinding wheel 80 is advanced against a preformed belt sleeve having the components previously described and shown in Fig. 1. The grinding wheel 80 is advanced against the belt sleeve to the point that the concave surface portions 100,102 come into contact with the rubber defining the ribs 38. The bottom surface 106 of the undercut 104 does not contact the belt sleeve so that no chips are removed from the surface 106.

Another advantage of the inventive structure can be seen with the belt 28 incorporated into a washing machine or dryer system shown at 110 in Figs. 6 and 7. The system 110 includes a driven pulley 112 having a flat outside surface 114 to be engaged and driven by the surrounding belt 28.

The belt 28 is trained around a drive pulley 116 and is maintained at a desired tension by a flat tensioning pulley 118.

In one exemplary system, the outside surface 114 of the driven pulley 112 has a width (*w*) of 300 mm. The driven pulley 112 has a diameter of 500-600 mm. The drive pulley 116 has a diameter of 14-16 mm and is driven at 3600 rpm. The flat tensioning pulley 118 has a diameter of 30 mm.

The inventive belt 28 is particularly desirable in a system such as that shown at 110 in that the rib surface portions 66 that engage the driven pulley surface 114 are unground/uncut. As a result, the coefficient of friction of the surface portions 66 remains high so that there is positive driving of the pulley 112 effected through the belt 28.

The foregoing disclosure of specific embodiments is intended to be illustrative of the broad concepts comprehended by the invention.

Claims

1. A power transmission belt comprising:
   an endless body having a length and defining an elongate rib,
   said body having an inside, and outside, and laterally spaced sides,
   said rib having an exposed surface to engage with a co-operating pulley,
   at least a first portion of the exposed rib surface being formed by at least one of grinding and cutting,
   there being a second portion of the exposed rib surface that is neither cut nor ground during formation of the power transmission belt.

2. The power transmission belt according to claim 1, wherein the rib extends lengthwise of the body.

3. The power transmission belt according to claim 1 or claim 2, wherein there is a projection on the rib and the second portion of the exposed rib surface is at least partially on the rib projection.

4. The power transmission belt according to claim 3, wherein the projection comprises a discrete projection.

5. The power transmission belt according to claim 4, wherein the discrete projection has a height between the inside and outside of the belt that is not greater than 1.0mm.

6. The power transmission belt according to claim 4, wherein the discrete projection has a height between the inside and outside of the belt that is not greater than 0.3mm.

7. The power transmission belt according to claim 4, 5 or 6, wherein the discrete projection extends along the entire longitudinal extent of the rib.

8. The power transmission belt according to any of claims 3 to 7, wherein the rib has a free end portion having a first surface portion facing in one of an inside and outside direction and laterally spaced pulley-engaging side surface portions between which the first surface portion resides, said projection residing between the pulley-engaging side surface portions.

9. The power transmission belt according to claim 8, wherein the first surface portion has first and second parts on opposite sides of the projection.

10. The power transmission belt according to claim 9, wherein the exposed rib surface has a part thereof defined by an arc of a circle which arc extends continuously from one of the pulley-engaging rib surface portions to the first surface portion to define a part of the first rib surface portion.

11. The power transmission belt according to claim 10, wherein the exposed rib surface part defined by the arc of a circle terminates at the projection.

12. The power transmission belt according to claim 9, wherein at least a portion of at least one of the first and second parts of the first surface portion has a convex configuration.

13. The power transmission belt according to claim 8, 9 or 12, wherein at least a portion of at least one of the pulley-engaging side surface portions has a convex configuration.

14. The power transmission belt according to any of

31. The grinding wheel according to claim 30, wherein the undercut has a radial extent of at least 1.0mm inwardly of the base surface portion.

32. The grinding wheel according to claim 30 or claim 31, wherein the radially extending projections have a radial outermost edge that is convex.

33. The grinding wheel according to claim 30, 31 or 32, wherein the facing grinding surface portions comprise roughened surfaces.

34. The grinding wheel according to claim 33, wherein the facing grinding surface portions have diamond particles deposited thereon.

35. The grinding wheel according to claim 33 or claim 34, wherein the material defining the facing grinding surface portions is shaped to define the roughened surfaces.

36. The grinding wheel according to any of claims 30 to 35, wherein the base surface portions and facing grinding surface portions are joined by a concave surface portion.

37. The grinding wheel according to claim 36, wherein the concave surface portion is defined by an arc of a circle.

38. The grinding wheel according to any of claims 30 to 37, wherein the grinding wheel has a circumference and the projections extend only partially around the circumference of the grinding wheel.

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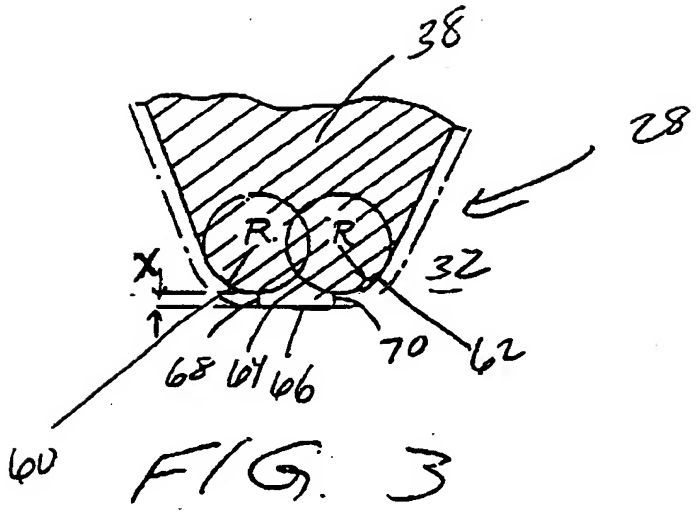
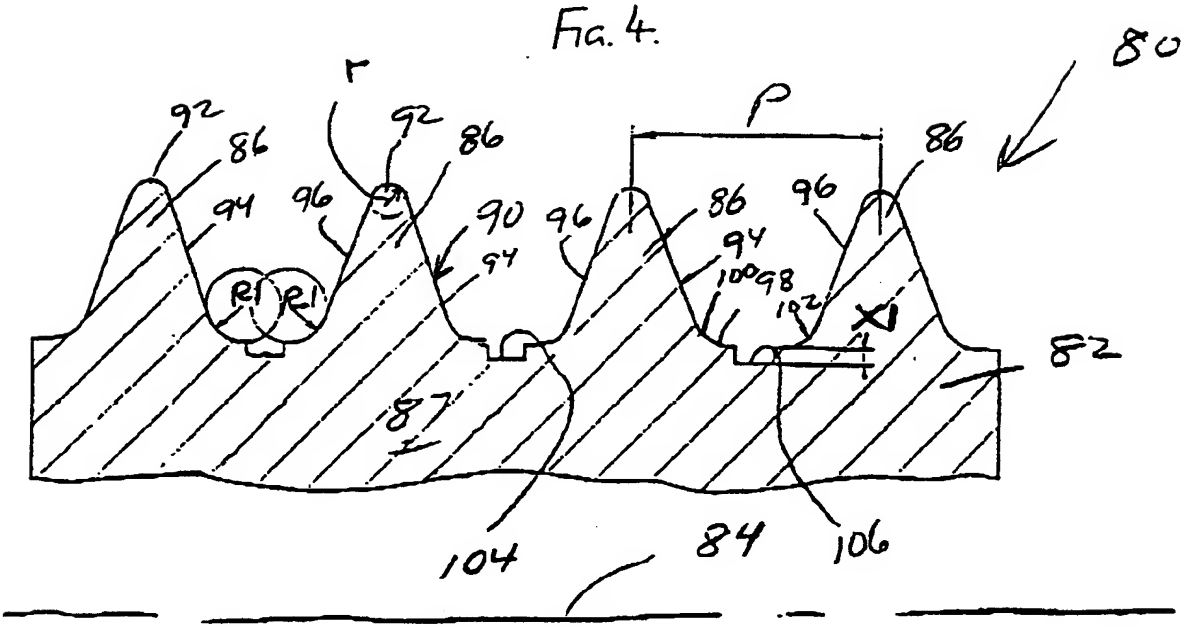


FIG. 3

FIG. 4.



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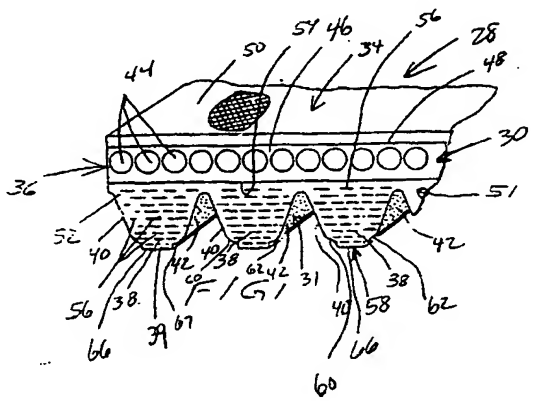

EP 0 633 408 A3

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.

☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid,

namely claims:

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions.
namely:

See sheet -B-

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid.

namely claims:

☒ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims.

namely claims: 1-24

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LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1-24: Power transmission belt with a surface of an elongate rib formed by grinding a cutting

2. Claims 25-29: Power transmission belt with a discrete projection on an elongate rib

3. Claims 30-38: Grinding wheel for producing a V-shaped rib on a power transmission belt